Approach Paper on Gearing BSNL Network For NGN Services "An Update"

Table of Contents

Executive Summary

The next generation networks represent an opportunity to reduce capital expenditures by being able to offer all services over a single integrated IP based infrastructure. The NGN aims to build up an integrated network through which any customer can access any service at any place through any device and at any time.

The moot point is to have a network in place which is device agnostic, access agnostic, location agnostic and service agnostic. Through such a network, different services such as Landline, Mobile, Broadband etc will complement each other rather than acting as a substitute to each other, which unfortunately is the trend today.

Further with this integrated approach, we not only add value to our existing landline base and thus provide enhanced value proposition to our Landline customer base but also keep ourselves ready to take on the next level of war in the mobile front, by leveraging on the strength of both landline and mobile network through Fixed Mobile Convergence and the enhanced services that arise thereof.

BSNL's Network Planning Group has carried out a detailed analysis of the major planning projects going on in corporate office and it is felt that these projects can be leveraged to migrate towards NGN framework.

a. The Strategic alignment (convergence) of these individual projects are critical to our efforts in not only optimizing our CAPEX but also drastically reducing the Network operational expenses (space, power, ACs, etc), which is a significant percentage (around 60%, including depreciation) of our operation expenses.
b. Strategic alignment of these new networks will not only increase our operation margin but will also help in effective utilization of existing manpower.
c. It will also help in protecting the large investment that BSNL currently undertakes or will be undertaking.
d. Further, it will make the migration path a lot easier as all the stakeholders (different planning wings in Corporate Office, field units, System Integrators / OEM partners) will be clear about the future road map and as such about their roles and responsibilities.

1.0 Background

World over today, the Telecom business is driven basically by technical innovation – what we call next generation technology. The need of the hour is to first get the business right. Then comes the task of making it efficient with the right product mix etc. The business is not about the old product set but of a new paradigm altogether – of a set of totally new services that transform the way people live an enhanced life style and the way they communicate with each other – that brings about an efficiency hitherto not even dreamt of by our customers. This represents a way to empower customers through a new infrastructure platform that makes it impossible for churn to happen, through keeping the customers continuously attracted to a variety of newer and newer services offered to them. This capability allows the ARPU to continuously increase with time.

Through next generation networks, different services such as Landline, Mobile, Broadband, etc. will complement each other and converge rather than acting as a substitute to each other, which unfortunately is the trend today.

The next generation networks represent an opportunity to reduce capital expenditures by being able to offer all services over a single integrated IP based infrastructure. Likewise, the Soft Switch and IMS architectures would extend multi-fold decrease in operational expenses like space, power, air-conditioning, human resource, etc. Implementation of NGN would therefore ensure increased revenue and profitability on an unprecedented scale.

2.0 Objective

Considering the imperatives pointed out above, the long term strategy and plan therefore sets its objective to

a. Define the steps to be taken to gear up BSNL for delivering multiple convergent services, also referred to as Next Generation services.
b. Implement a 5-year (2009-14) migration roadmap for IMS based NGN infrastructure that supports the concept of "Any service, any access, any time, any place and any device" thereby bringing about Fixed Mobile Convergence.

3.0 Performance issues

Certain relevant facts that are a direct pointer towards BSNL's corporate performance are listed below and need to be addressed.

(a) BSNL's year-on-year growth has been cited as only 11% as against its competitors' figures of 45% to 55%. The consequences of such a slow growth rate has resulted in steady decline in its market share and in product lines becoming less competitive leading to heavy churn and lowering of ARPU. Thus the issue that needs to be addressed is – What should be the quantum of growth this year in terms of financial investment? What should be the growth year-wise for the next 5 years?

(b) We have witnessed a decline in Fixed Line customers to the tune of 2 million per year, consecutively for 3 years. The primary factors driving this has been analyzed to be "mobile substitution". This in turn has been due to inherent product limitation, inconsistent tariff structure between fixed and mobile services and inadequate service quality and assurance. We therefore need to address – What strategy should we adopt to arrest this churn immediately?

(c) The growth in broadband has been considered to be too slow. The factors responsible for this have been cited as low PC penetration levels, limited consumer awareness and poor availability of local content & applications. Can we think of out-of-the-box solutions to circumvent these limitations? Can BSNL take advantage of latest technologies to increase its broadband penetration multifold, taking the deployment to say 50 millions by 2012 and another 50 millions by 2014? Can it build a basis for multiplying the revenue to levels much beyond the mundane "MoU" expectations?

4.0 Strategy to Redefine Product Offering

Traditional offering of POT service has been declining for the last three years. The ARPU from POTS has also been declining. It is therefore necessary to add significant value to POTS and also provide additional services on broadband so that the customer has incentive to continue the service.

Also, mobile offering is witness to ruthless competition, and it is but a matter of time that this sector too will start experiencing the pressures of churn. It is therefore imperative that we work on increasing the value of our mobile offering also.

Re-examining the entire concept of service offering in the long term perspective, we recognize that the Telecom business is primarily driven by technology. The Next Generation Networks provide an opportunity to deploy a single integrated network that could provide convergent services involving voice, video and data, or what is also termed as multimedia services. Hence the essential difference this makes to the top and bottom lines of a company is to extend the opportunity of providing multiple services to the customer, thereby increasing the ARPU. Further, the nature of the delivery platforms in the new IP based networks brings down capital and operational expenditures considerably. The capital expenditure reduction emerges from centralization of resources. Savings in operational expenditure comes from a near-ten-fold reduction in power, space and human resource requirements.

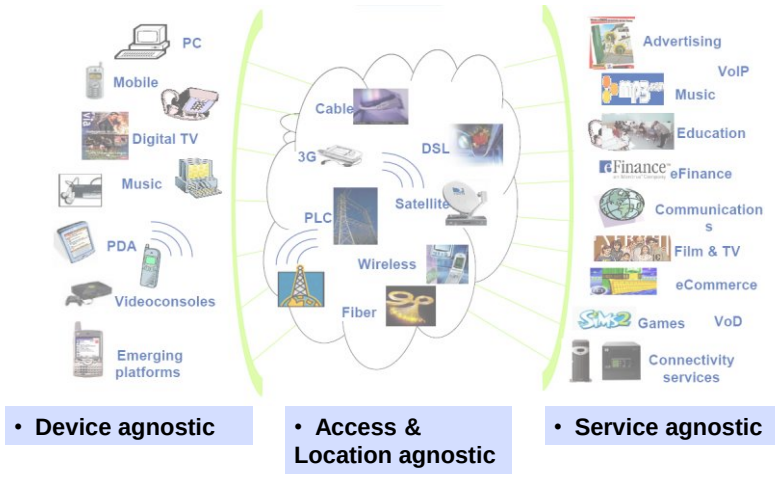
We further recognize that communication can be viewed as interaction between users in a collaborative environment – which includes one-to-one, one-to-many and many-to-many – involving triple play media in interactive modes (Telephony, Instant Messaging and Streaming) as well as non-interactive modes (Voice Mail, E-mail and Video Mail). These collaborative services can be tied up with presence framework technologies to significantly enhance what customer perceives as value, in terms of ease of accessibility and reliability. Customers would like to use a combination of devices for such interaction and would abhor the idea of being limited by any single device. As a matter of fact, they would look forward to using mobile as well as fixed devices interchangeably.

The road to next generation IMS architecture may be seen as beginning with simple ways to implement interchangeability of devices. For instance, we may think of offering the full set of interactive and non-interactive services specified above in a small but significant way, by using the existing assets and infrastructure. The design of a converged IP based infrastructure therefore begins with what the customer wants and what the customer perceives as value, and we build such infrastructure step-by-step to support our business. We therefore have to define a roadmap to implement IMS based Next Generation Network services in multiple phases so as to complete the process of full NGN within a definite period of say five years.

5.0 Strategy for Next Generation Service Platform

The architecture and platform for next generation services has been envisaged to be device agnostic, access agnostic, location agnostic and service agnostic as shown in Figure 1.

Figure 1: Next Generation Services



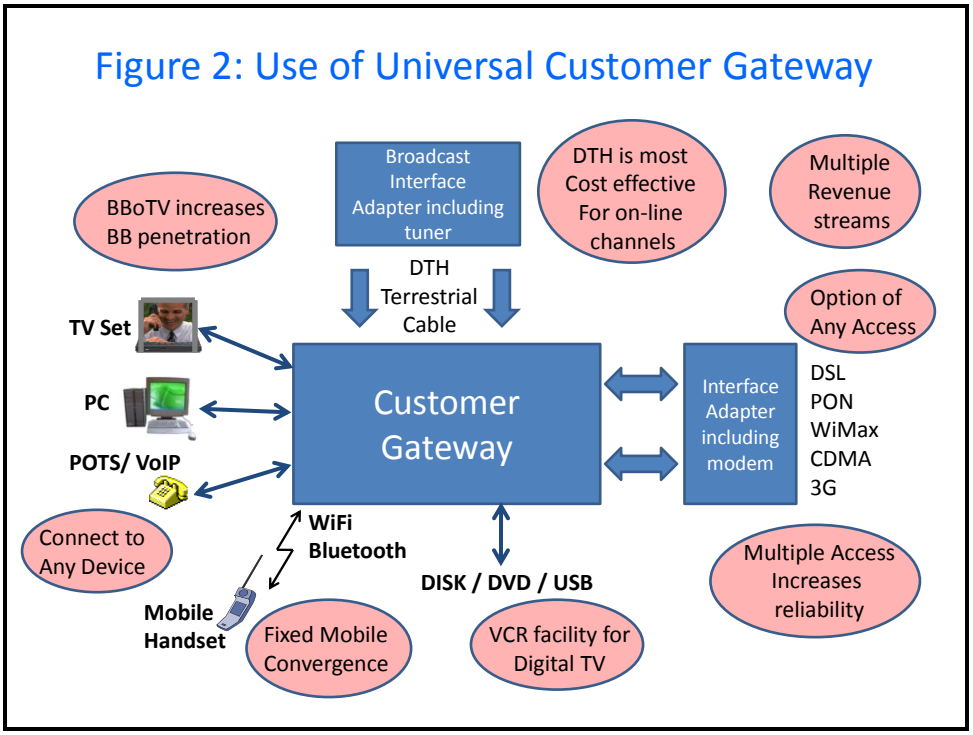
The devices shall be inter-operable in all respect to provide unified interaction between any entities, communications service or content download through any access technology, fixed or mobile, located anywhere and using any terminal. The

communications platform shall support collaboration and presence as essential features. Such a platform shall provide us with capability to expand value added service base that will ever increase the perceived value to the subscriber.

6.0 Growth and QoS issues in Broadband

Low PC penetration level in the country has always been a bottleneck for the growth of broadband. However, home gateway technology today has matured to accommodate TV set as a valid display device for viewing Web pages, VOD, TV channels as well as text messages. The TV penetration of 110 mn can offer the possibility to target so many more potential subscribers to broadband. Thus a universal customer gateway capable of serving any device including a TV set and accommodating connectivity with any access technology (DSL, Satellite, Cable, OFC, Wireless, etc.) is indicated in Figure 2. Such a gateway can be the stepping stone to a convergent services platform.

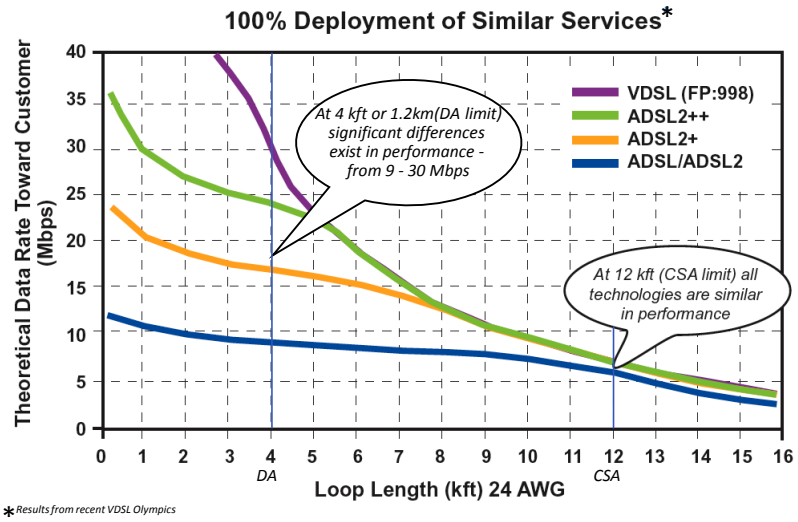
Figure 2: Use of Universal Customer Gateway



The throughput of broadband is an important measure to assess the Quality of Service (QoS). An associated parameter is the Quality of Experience (QoE) which gets directly affected with increased number of customer terminals on the single IP pipe. The

throughput characteristics of DSL technologies as a function of distance of the modem from the DSLAM are indicated in Figure 3. The ability of the copper to provide enormous throughput has virtually increased its value. We have an opportunity so to say, to be able to turn copper into gold.

Figure 3: How xDSL can turn Copper into Gold



It may be observed from the characteristics that different DSL technologies can be differentiated at a loop length distance of 1.2 km. It may also be noted that beyond about 3 km, there is significant drop in throughput and consequently subscribers beyond 3 km upto the full range of 5 km that an exchange normally serves would not be enjoying the same throughput that is required for a good quality of experience.

7.0 Restructuring of BSNL's External Plant

7.1 The external plant of BSNL is generally designed to serve analog voice service to customers within a radius of up to 5 km from the Central Office as shown in Figure 4. The concept of RLUs and RSUs has brought down this copper loop distance to about 3 km in bigger cities. The distribution network has pillars located to serve customers whose premises are limited to about 1 to 2 km, the remaining distance to Central Office being served by a feeder cable.

If DSLAMs are co-located with mobile BTS in out-door cabins at tower sites, and connected to nearest pillars to cover customers within a radius of about 1 to 2 km from the tower location, and backhaul connectivity between this co-located sites and the Central Office (CO) site could be converged into a single pipe, we would not only be able to ensure adequate throughput to customers to give an excellent QoE and QoS, and be able to offer significantly higher throughputs through VDSL technology, but also effect considerable savings by avoiding duplication of backhaul infrastructure. At present, we can offer VDSL service to customers located within 1.2 km of road distance from a RLU or an RSU, leaving out nearly 80% of customers from opting for such service.

This restructuring of the external plant depicted in the lower half of Figure 4 shall enable truly high quality triple play services over DSL so that multiple revenue streams can be realized over a single IP pipe, rendering the network NGN-ready.

7.2 Similar problem is faced by the Mobile services where the BTS or the Node B are expected to serve customers at distances ranging from 2 km. down to about 450 metres. This distance is expected to reduce considerably for 3G and later on for WiMax and LTE.

7.3 It would therefore be beneficial to converge the wireless backhaul point and the wire-line backhaul point and effect considerable savings in Capex on infrastructure and consequently reduction in Opex also. Thus the new NGN networks envisage convergence of BTS (Node B) employing wireless access and the MSAN employing wire line access at the common point which can be termed as Access Node (AN). The same Layer 2 backhaul technology can serve wire line access as well as wireless access. Ultimately, the IP Multimedia Sub-system (IMS) is expected to complete the convergence in the Core.

7.4 The detailed concept of External Plant restructuring is indicated in Figure 5. The Central Office is connected with customers through Out Door Cabinets collocated with Wireless towers acting as Layer 2 backhaul through Optical Fibre. The Serving Area comprises ideally of a circle with radius 1.2 km. This restructuring allows BSNL to offer different types of access equipment to cater to different throughputs and hence cater to different SLAs.

Figure 4: TDM to NGN Migration in External Plant

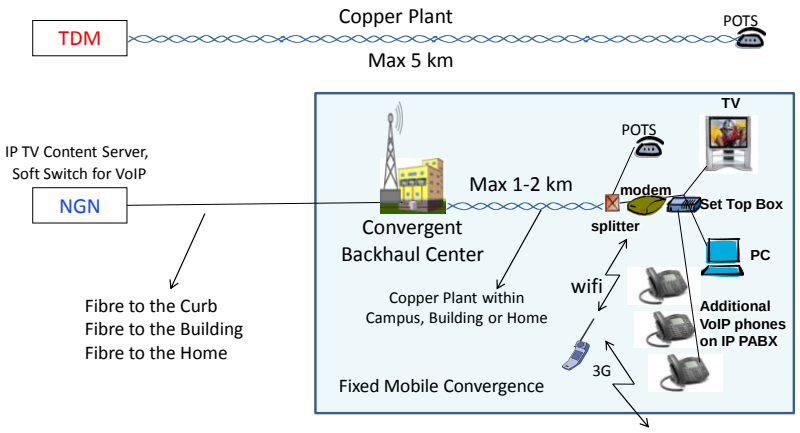
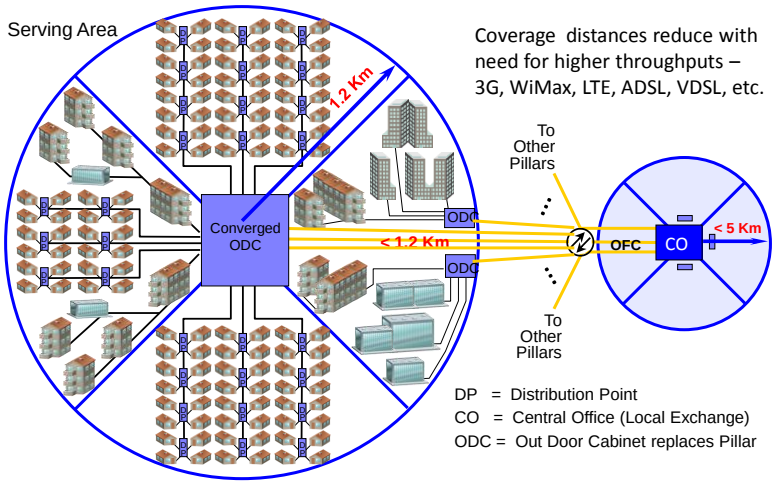


Figure 5: Collocation of BTS Towers with DSL & PON backhaul - Convergent ODC



8.0 Five year NGN migration Plan for BSNL

8.1 The NGN migration Plan for BSNL:

The NGN plan for BSNL essentially involves an overlay deployment of NGN over the present network with seamless interoperation. When we talk of migration, NGN has two connotations. One, NGN means controlling the analog voice over POTs from a SIP based Soft Switch located in the Control Plane. Second, NGN would mean deployment of a high throughput customer gateway at the customer premises essentially enabling connectivity through landline access systems such as DSL and PON, though wireless access such as 3G and WiMax could also be available.

To arrest landline churn, it is absolutely essential to implement the first connotation in the shortest possible time, say in two years. No forced reduction in the present TDM Switching Plant is envisaged. The reduction will be based only on the feasibility of continuing with the old equipment as the NGN services pick up.

Addressing the second connotation that includes the high throughput and the Customer Gateway, Table 1 shows the proposed NGN deployment plan over a 5-year period.

Year	NGN lines (Millions)	Net NGN (Millions)	Revenue (Cr. Rs.)
2009-10	3	3	
2010-11	9	12	4,978
2011-12	12	24	19,912
2012-13	16	40	39,823
2013-14	22	62	66,372
2014-15			1,02,877

Table 1: Proposed 5 Year NGN Migration Plan and accruable annual revenue

8.2 Need for Coordinated approach:

The accruable year-wise revenue through NGN deployment are also shown in Table 1. These figures are based on assumptions made in respect of multiple services that would be offered on NGN platform, which are indicated in Table 2. The revenue factor basically makes it imperative for BSNL to deploy NGN at the earliest. This alone is the solution to the increasing churn in landline and falling ARPUs. However, the stated revenues will accrue only if there is cohesive effort between the different verticals, viz. Planning, Marketing, Commercial, Operations, HRD and Finance in appropriate positioning of the product.

Table 2: Multiple services in NGN creates opportunity for increased ARPU

Services	Residential (53.5%)	Small & Medium Business (25%)	Large Business (15%)	Government (4%)	Education (2.5%)
HI Speed Internet	150	300	600	150	150
SMS-MMS-Chat	50	50	50	50	50
VOD + Channels	300	200	200	200	200
Video Conf.	100	200	600	300	600
Multimedia-net	50	400	1000	800	1000
VOIP	200	300	500	200	200
TOTAL ARPU	**850**	**1,450**	**2,950**	**1,700**	**2,200**

8.3 NGN Architectural Model

The new network is based on an architectural model of 5 network nodes. These are:

- Customer Premises
- Access Node
- Metro Node
- Core Node
- iNode

8.3.1 Customer Premises (CP)

The Customer premises node includes residential, Small-Medium Enterprise (SME) and Enterprise. All these points will have high speed connections to the network, delivered over copper (in the form of ADSL or other DSL technologies) or over fibre, as either PON or direct fibre in the case of large enterprises or over Wireless technologies (3G, WiMax, DTH, etc.). The CP will also be serviced by the Plain Old Telephone analog voice service powered by the conventional exchange DC power supply. The exchange end shall however be migrated to VoIP service as part of NGN.

8.3.2 Access Node (AN)

Access Node is a logical node that takes the various access technologies (mentioned above) and is therefore termed as a Multi-Service Access Node (MSAN). It essentially aggregates these services onto a single layer 2 backhaul network technology called Multi-Play. This includes converting analogue voice into Voice over IP (VoIP) using the MSAN as a Media Gateway (MGW). Note that these will not have any IP routing capability, but will essentially be Layer 2 Ethernet devices.

8.3.3 Metro Node (MN)

The backhaul network will terminate on the metro nodes. At this point the IP-based services will be implemented, and the metro nodes are the first location where IP traffic is routed. Call control (via a softswitch or an IMS CSCF) will be implemented here, although the softswitches and the IMS components won't be described as a part of the metro node - they are parts of the iNode. The metro nodes are also Provider Edge (PE) routers in MPLS terminology, encapsulating the IP traffic in MPLS tunnels for transmission over the core.

8.3.4 Core Node (CN)

The core nodes are MPLS switches, with the MPLS traffic carried over optical (DWDM) transport. They are completely unaware of customer IP traffic, and only switch based on MPLS tags (all customer IP traffic is encapsulated with an MPLS header by the Metro node PEs). Native IP is only used by the Core nodes for protocols such as MP-BGP, an IGP, LDP, and RSVP to exchange routing and label information between all Core and Metro nodes.

8.3.5 iNode (iN)

The iNode is the name for the logical node that provides the control for the services implemented using the other 4 nodes. Eventually, the network would have an IMS based iNode capability. The iNode will implement a set of standardized functions - common capabilities - that deliver layered services. Common capabilities include session management, authentication, profile, address book, presence and location. Combinations

of these capability primitives will be used to deliver different service types and functionality.
The following Table shows iNodes that are currently operational in BSNL's network.

Table 3: iNodes currently operational in BSNL's network

		MPLS	Agg-N	IN	CMTS	IP TAX	NGN
1	Bangalore	Y	Y				
2	Pune	Y	Y		Y	Y	Y
3	Hyderabad				Y	Y	Y
4	Kolkatta				Y	Y	Y
5	Chandigarh				Y	Y	Y
6	Lucknow			Y			
7	Chennai						
8	Ahmedabad			Y			

8.4 Main components of NGN Project:

NGN Project involves a number of components that need to be simultaneously executed by different Project wings. These are as follows.

A. <u>Customer Gateway</u>:

i. **<u>Current Status:</u>** Presently we have a separate CPE for different type of access and different type of device to which CPE is connected. We have a DSL modem for connecting to Laptop, a Set top box for connecting to TV, a different CPE for connecting to fibre and so on.

ii. **<u>Key Concern Area:</u>** The concept of having different devices for different access is contrary to the current mindset of the customers where simplicity and convenience are the essence. Further, different set-top box offered by the franchisee doesn't interoperate with each other resulting in a walled garden solution offered to BSNL customer. The experience and service offering available to BSNL customer under one solution is different from that available in another solution. This is because different solution adopts different set of standards with scant regard to interoperability.

iii. **<u>Way Forward:</u>**

1. In an integrated world, what we require is a device which can connect to any device (TV / PC / Phone) on the customer side and any access network on the service provider side (DSL, FTTX , Wireless).
2. Further we need to adopt a uniform standard so that all customers can access any content seamlessly. This will require adoption of a

standard set of communication protocols based on standards that should be applicable in the entire BSNL network.

3. Further, this device can provide seamless access to 130 Mn TV customer base which can be targeted for the proliferation of broadband.

4. ***BSNL therefore, is in the process of firming up its requirements in this respect, by inviting vendors, who could deliver the same, engage in product validation and position the product for large scale deployment.***

B. <u>Last Mile Access Network:</u>

i. **<u>Current Status</u>**: Broadly two types of high speed access are there – Landline and Wireless. For Landline, the access technology predominantly deployed in BSNL is DSL (as part of NIB-II and Broadband Multiplay Project) followed by Fibre (FTTH, GPON, GEPON). In Wireless we have 3G, Wi-Max and in future LTE. Further we are planning 1 Mn lines LMG (Line Media Gateway) as part of Class V NGN deployment.

ii. **<u>Key Concern Areas</u>**:

1. All these access technologies (except fibre) suffer from the inherent limitation of reduced speed as the distance between the access network element and the customer premises increases. Even the wireless technologies such as Wi-Max and LTE suffer from this limitation.

2. The design of these access technologies are done independent of each other. These technologies are made to compete with each other rather than complement each other. As a result, as the traffic increases we tend to deploy more BTSs in a city ignoring the fact that we already have considerable fixed assets and statistically 60% of the calls terminate or originate within building.

3. It may also be noted that beyond about 2.5 km, there is significant drop in throughput and consequently subscribers beyond 3 km upto the full range of 5 km would not be enjoying the same throughput that is required for a good quality of experience. ***However, we cannot simply lay the fibre across the length and breadth and do away with the existing Cu asset.***

4. *The Class V NGN has been predominantly planned to replace life expired E-10B switches. With our new focus on earning more revenues through multiservice offerings, we would need to alter the utilization and ordering pattern in the said NGN tender. From the present plan for 7.5 lacs E-10B replacement and 2.5 lacs broadband, we need to target at least one third of the E10B replacements for NGN lines so that we end up with say 5 lakh for E-10B POTs replacement and 5 lakh for broadband / NGN.*

iii. **Way Forward**:.

1. In most of the big cities, it is understood that the exchange domain (for RLUs and RSUs) caters to around 3 Km which is almost within the desired distance for 80% of customers. Assuming 50% degradation due to cable defects and protocol overheads, the residential customers can get speeds of up to 6 Mbps.
2. For Enterprise and premium customers, we can use a combination of VDSL2+ (for distance upto 1.2 km) and fibre for distance beyond 1.2 Km for targeting speed of 20 Mbps.
3. The above stated bandwidths are sufficient to meet the immediate requirement. However, the same needs to be further increased as bandwidth intensive services become more popular.
4. For other cities where exchange domain is around 5 km and to take proactive action for further reducing the distance, there is an immediate need to re-engineer the External plants and to have a mechanism in place whereby DSLAMs can be planned at the remote Pillar thereby effectively circumventing the distance constraint. We need to take care of security, power, and external hazards to make such a system reliable.
5. The present plan for 7.5 lacs E-10B replacement and 2.5 lacs broadband as part of Class V NGN deployment may need to be changed to say 5 lakh for E-10B replacement and 5 lakh for broadband / NGN.
6. Steps should also be initiated whereby different access technologies (Wireline and wireless) complement each other rather than compete with each other.

C. Metro Area Aggregation Network:

i. **Current Status:** As part of Broadband Multiplay Project, BSNL has deployed RPR based aggregation network with 10Gbps bandwidth in 98 cities. The same is being expanded to SDCA level also as part of current multiplay plan. Also in cities where FTTH is deployed, additional RPR based aggregation network is in place.

ii. **Way Forward:**

1. BSNL could leverage on such a high capacity RPR based aggregation network to provide **metro-connectivity between the Service Centre at Central Office and the customer end.**
2. Future expansion of metro-connectivity has also to take into account the **backhauling requirements of wireless as well as wireline services.**

3. Further BSNL can leverage on the capability of Carrier Ethernet to further expand the metro area aggregation network to other SDCAs / smaller SSAs

D. <u>Transport – Network</u>:

The MPLS based IP Transport network is the backbone to ensure seamless flow of traffic for voice, video and data originating from any access network (landline, broadband, mobile, Wi-Max etc) and terminating on any access network.

i. **<u>Current Status</u>**: BSNL has deployed a multi-Gigabit MPLS based IP infrastructure to act as a unified transport network for voice, video and data as part of NIB-II. The network is carrying traffic of data services (internet, broadband), data traffic of CDMA and Mobile (GPRS / 3G) and inter-Circle Voice Traffic of GSM.

ii. **<u>Key Concern Areas</u>**: There are two critical areas that need to be addressed on priority to ensure that the Transport network is in alignment with the NGN framework.

1. **Avoid duplication of MPLS backbone:** As part of Phase V deployment in Mobile network, a separate MPLS network for carrying intra-Circle traffic has been deployed. Having parallel MPLS network with almost similar capability not only lead to increased CAPEX and OPEX but also pose lot of issues related to maintenance.

2. **Leverage on the Capability of Multi Play and deploy Carrier Ethernet for further growth:** Further, in the recent years Carrier Ethernet has come in a big way to meet the carrier class requirement in terms of availability, redundancy, reliability and QoS of Service provider. Further, Ethernet Switches are comparatively cheaper than the MPLS Routers. It is felt that the conjunction of MPLS network along with Carrier Ethernet appears to be the cost effective way to expand the Core Transport network across all SSAs.

iii. **<u>Way Forward</u>:**

1. **Position MNGT as a unified core for all services**: The current MPLS network established as part of NIB-II and getting further expanded as part of MNGT should be the unified Core Transport for all the services emanating from landline and mobile. The MPLS VPN service offered to Enterprise customer is also getting served through the same MPLS VPN network.

2. **Synergize MNGT with Multi Play / Carrier Ethernet**: Further, instead of deploying MPLS Routers in all SSAs, the MNGT should leverage on the capability of the Carrier Ethernet to expand the domain of Core Transport Network to all SSAs. This will require re-looking the design of MNGT purely from the traffic perspective

and not from the SSA concept. This will ensure effective utilization of CAPEX without compromising on any of the key success factors of the network.

E. Core-Switching + Service:

i. **Current Status**: Presently each business network is having its own set of AAA systems with its own set of repository for storing customer profile. In Broadband, this functionality is done by AAA + LDAP, in Class IV we have a Soft-switch + Database, in the planned Class V NGN a separate Softswitch + its own database is there. In mobile, this functionality is done at two levels – the switching functionality at the level of MSC / MSC-S and core service functionality at the IMS level with the customer profile stored in HSS.

ii. **Key Concern Areas**:

1. Because the core –switching function of one business need is independent of another business need, our network has become a collection of independent silos and as such different networks are substituting rather than complementing each other. Lots of duplication is there in rolling out a service across different access networks because of independent core-switching and the associated service layer. Also for a customer, there is no seamless experience.
2. Most of the network design is still done with the Circle / SSA concept in mind. In IP world, the whole country is flat and as such we need to change the mindset. The deployment of Class IV (IP TAX) Soft-switch, presently planned with Circle concept, needs to be reviewed purely from the technical objectives such as scalability, reliability, quality of service etc. and reorient the architecture accordingly.
3. With the deployment of Class V NGN, both in the Wireless as well as in the wire line network, the traffic of Class IV NGN will come down. Hence, the Class IV IP TAX network dimensioning needs to be reviewed, and the capacity thus saved should be deployed for Class V roll-out, which is part of the requirement of the IP TAX Soft Switch. This Class V roll-out is an excellent opportunity for BSNL as the IP TAX tender is in the take off stage.

iii. **Way Forward**: In our mission to build an integrated network with seamless experience across all technologies, following is suggested.

1. In the immediate run, Fixed Mobile convergence (FMC) to be implemented through which mobile customer can leverage on the DSL infrastructure. Since around 60% of the calls are made when we are inside building / room, this will not only lead to efficient

use of scarce spectrum but will also enhance the value proposition of landline.

The detailed approach paper on the implementation of Fixed Mobile Convergence is attached at Annexure I.

2. The FMC can be further enhanced in our network through the implementation of VCC (Voice Call Continuity). This feature has been asked in the IMS Phase I.

3. From long term perspective, we need to have a clear cut road map for migrating towards common control and repository.
   (i) In the immediate to medium run, we will have two databases and two control layer. One for the IP network – soft switch and associated database- and one at the mobile network.
   (ii) Further, an expert committee needs to be constituted which can suggest as to which control can take the central role based on the recommendation of ITU-T, comments of prospective OEMs and keeping into account the BSNL requirement.

F. <u>Application + Content Delivery Network</u>:

i. **<u>Current Status</u>**: The CDN tender has recently been finalized and include components such as Head end system, VoD server, DRM system etc.

ii. **<u>Key Concern area</u>:**

1. **<u>Duplication of activities in the service roll out</u>**: Since application layer is intrinsically linked with the Core-service layer and because today different networks have its own core-service layer, lot of efforts are duplicated in order to offer similar service across different technologies.
2. **<u>No unified Service delivery Platform</u>** (SDP): Further, within a particular network say broadband or mobile, because of non-availability of unified SDP, each franchisee has to re-design all the user related activities such as subscriber management system, operational support system, billing system etc.

3. **Content delivery infrastructure**: BSNL has been following a predominantly franchisee route: This has resulted in a walled garden solution as franchisee operates with scant regard to inter-operability. The user experience also varies drastically within a city because of multiple franchisees operating in the same city.

4. **Eco-System**: The key concern in any CDN is to ensure security and reliability of rights management. The content owners are paranoid of piracy. The Digital Rights Management domain should therefore extend right up to the Content Owners' servers. Also, the decryption mechanism should be linked to the payment system.

iii. **Way Forward:**

1. **Unified Service Delivery Platform (SDP)**: Mobile planning wing has already initiated step for the implementation of unified SDP through which standard interface in the form of plug-in will be provided to different content provider. The same SDP is to be further expanded to take care of IP based broadband multiplay infrastructure on which different access technologies such as DSL, FTTH, Wi-Max, will ride.

2. **Integrated CDN with single source for generic content** The deployment of franchisee based infrastructure has created a walled garden solution. To ensure that BSNL provide a seamless experience to its IPTV experience, BSNL should deploy its own CDN progressively. Further all the generic contents such as broadcast channels should be either sourced directly from the content owners or from the single source to ensure uniformity in content delivery.

3. **Content Security and Billing**:

   a. A content security and billing system encompassing all stakeholders such as content owners, service providers, payment agents and customers for seamless operational support needs to be in place so that content is delivered to the authorized customer after due authentication and payment with minimal chance of piracy.

   b. Any customer should be able to access any content irrespective of its location in the network.

   c. Latest technology such as crypto-security and water-marking on end-to-end basis i.e content host to customer-end device should be implemented.

   d. The model should be scalable.

G. Integrated OSS and NMS Application:

A. Centralized OSS Application:

i. **Current Status:** The CDR based billing system under deployment is best geared up to handle the centralized OSS application as it is already meant to cater to the OSS applications of landline and broadband. Further, since 90% of the mobile customers are pre-paid, only concern will be of 10% post paid customers who need to be integrated with CDR based billing.

ii. **Way Forward:** The CDR based billing system could be leveraged upon for the OSS application in the NGN domain.

B. Centralized NMS Application:

i. **Current Status:** Presently we have separate NMS applications for different networks such as separate NMS for broadband, MLLN, Mobile, IT infrastructure. In Class V NGN also, separate NMS is being asked.

ii. **Key Concern Areas:** The non-availability of NMS for Transmission network is a big deterrent in our endeavour to meet the committed SLA to enterprise customer. Also, fragmented NMS systems do not help in conveying an integrated view of the end-to-end network, and is likely to pose a major hurdle in providing convergent services.

iii. **Way Forward:** A Master NMS, which will integrate with the existing NMS along with the NMS of Transmission network should be in place to ensure a unified view of all the distinct elements of the network. The master NMS shall have to be a generic product and integrating different NMSs under it will involve considerable customization and programming work that would need to be outsourced.

9.0 The Way Forward

As can be seen from above, all the major projects presently undergoing in Corporate office, though planned independently to cater to respective business needs, are an integral part of the NGN framework and as such need to be aligned with this big picture. Keeping the aforesaid issue in mind, the Management Committee approved the following approach.

9.1 **Time-bound Implementation**:

The NGN framework in BSNL network outlined in this document and specified in point 8.4 above needs to be implemented in a time-bound manner. The respective planning wings of different vertical are responsible for the implementation of the same. The same will be coordinated centrally by the Corporate Planning & Monitoring Cell. ***The above implementation will also require strategic alignment of various projects which is summarized below***.

9.1.1 **Class V NGN Project**:

9.1.1.1 The present plan for 7.5 lacs E-10B replacement and 2.5 lacs broadband need to be changed to 5 lakh for E-10B replacement and 5 lakh for broadband / NGN

9.1.1.2 The Soft-switches and SIP Application servers planned as part of this tender will be used as part of NGN framework.

9.1.2 **Broadband Multiplay Project**:

9.1.3 40% of the broadband customers amounting to around 2.4 Mn customers by 2010 to be migrated to NGN.

9.1.4 Bring DSLAMs closer to customer premises – Guidelines to be issued by broadband cell to deploy DSLAM in the BTS.

9.1.5 **Class IV IP TAX Project**:

9.1.5.1 The existing deployment of soft-switch at each Circle needs to be modified to deployment at the Zonal level in 1+1 physical diversity.

9.1.5.2 The dimensioning of Class IV IP TAX need to be reviewed in the wake of the large scale deployment of Class V NGN in both wireline and wireless technology.

9.1.5.3 The spared soft-switches needs to be upgraded to support Class V functionality.

9.1.5.4 The other infrastructure already part of this project such as Trunk Media gateway, Signalling gateway etc will be part of the NGN framework.

9.1.5.5 Additional component such as SIP Application servers, not part of the current project, to be explored to be purchased from the shortlisted SIs to ensure end-to-end implementation.

9.1.6 **FTTH (GPON and GEPON)**:

9.1.6.1 All FTTH lines to be positioned as NGN lines

9.1.6.2 A total capacity of 7 lakhs (5.5 lakhs from GPON and 1.5 lakh from GEPON) to be used in the current year.

9.1.7 NIB-II + MNGT:

9.1.7.1 Position NIB-II + MNGT as a unified transport for all IP based traffic emanating from different access technologies, both wireline and wireless.

9.1.7.2 Review the design of MNGT. The deployment of MPLS Routers should not be based on the old concept of SSA but should be purely dictated from the point of view of traffic.

9.1.7.3 Synergize Carrier Ethernet with MNGT: Leverage on the capability of Carrier Ethernet to expand the transport network to remaining SDCAs and smaller SSAs.

9.1.8 Mobile Network (Phase VI):

9.1.9 Integration of IMS service layer with other IP based network to provide Fixed mobile convergence and services like Voice Call continuity (VCC).

9.1.10 All IP traffic from mobile network such as voice (intra circle, inter circle), video and data should ride on the MPLS infrastructure deployed as part of NIB-II and getting further expanded through MNGT project.

9.1.11 The Service delivery platform (SDP) designed for mobile network should be expanded to cater to the requirement of IP based network.

9.1.12 The design of BTS location for 2G, WCDMA, 3G, LTE (in future) should be worked out by considering the available fixed access technologies also in the area under reference to ensure synergy across these two diverse technologies – Around 60% of the calls originate or terminate at home / office.

9.2 **NGN - Immediate deployment:** Since, most of the required network elements required for taking the first step towards migrating to NGN framework is in place, it is planned to deploy a NGN base of 3 Mn lines in the current year and float tender for procuring client application and ATA devices for accessing SIP based services. Also carry out trial for FMC. The broad activities involved are:

9.2.1 Access:

9.2.1.1 Leverage on Multiplay access infrastructure (40% of 3.6 Mn existing + 2.5 Mn new customers) = 2.4 Mn

9.2.1.2 FTTH Lines = (90% of 5.5L GPON & 1.5L GEPON) = 0.6 Mn

9.2.1.3 0.5 Mn capacity in first phase of class V NGN project to be NGN enabled, capacity to be used in 2010-11

9.2.2 **Services (VoIP & High Speed internet):**

9.2.2.1 Use Class IV IP Tax infrastructure – 12 spared soft switches (upgraded to Class V functionality) with Signaling Gateway (SG) and Trunk media Gateway (TMG) to provide 3 Mn VoIP capacity.

9.2.2.2 Tenders to be called for Client software for broadband customer and ATA device for VoIP.

9.2.2.3 Leverage on Multiplay back-end infrastructure for High speed internet access.

9.2.3 **Fixed Mobile Convergence**:

9.2.3.1 An EOI be floated to carry out trial of Fixed Mobile Convergence

9.2.3.2 Upon successful completion of the trial, the same to be expanded to the national level.

9.3 **NGN – Proof of Concept:** There are few elements such as Universal customer gateway, eco-system for content delivery with integrated security and billing and deploying DSLAMs at the pillar location which are specific to BSNL and as such need to be spelt out and need to be tested. For this following steps are proposed:

9.3.1 A separate committee be constituted to freeze the requirement of BSNL w.r.t aforesaid proposal

9.3.2 Float an EOI to carry out the trial in few locations

9.3.3 Explore the possibility of in-house manufacturing

9.4 **NGN – Further Deliberation:** The issue related to complete convergence at the control layer, to be implemented in the long run, needs to be further deliberated with the focus on convergence driven by ITU-T. For this following steps are proposed:

9.4.1 A high level committee consisting of officers from mobile, fixed, enterprise and overall coordinated by CP&M cell is constituted to further deliberate on this issue through intensive analysis of ITU's recommendation, 3GPP recommendations and discussion with OEM's

9.4.2 The officer involved should also be actively associated with relevant ITU-study groups.

9.4.3 The officer should also analyze what other operators, similar to BSNL, are doing.

9.5 **NGN – Administrative Proposal**: To ensure that the above recommendations are implemented in the time bound manner and to ensure that all current and future projects are strategically aligned and different verticals of BSNL complement in each other in BSNL's service offerings / value proposition to customers. To achieve this, following is proposed.

9.5.1 The above proposal spells out in detail about BSNL's Planning strategy in the coming years. Similar strategy, consistent with the aforesaid strategy, needs to be worked out for marketing (target customers, service offerings, tariff), operation (business processes for service delivery, service assurance) and HR (identifying the right person, inculcating with right skill and putting in right place) for the end-to-end implementation. The same will be coordinated by the Corporate Affairs unit in consultation with respective GMs of each vertical.

9.5.2 The initial deployment shall be monitored by a high level committee specially constituted with officers drawn from across all verticals. The monitoring shall be comprehensive and validation of the concepts in commercial terms. The deployment shall also help field units in different Circles to participate and bring about awareness of the new paradigm.

9.5.3 Further, all changes in the current project and the conception of new project be vetted, at the macro level, by the Corporate Affairs unit.

****